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**Claims**

1. Method for applying phosphate coatings to metallic surfaces by wetting with an aqueous, acidic phosphating solution and subsequent drying of the phosphating solution, usually without subsequent rinsing, characterised in that the phosphating solution contains
  - 26 to 60 g/l of zinc ions,
  - 0.5 to 40 g/l of manganese ions, and
  - 50 to 300 g/l of phosphate ions, calculated as  $P_2O_5$
- 10 2. Method for applying phosphate coatings to metallic surfaces by wetting with an aqueous, acidic phosphating solution and subsequent drying of the phosphating solution, usually without subsequent rinsing, characterised in that the phosphating solution contains
  - 10 to 60 g/l of zinc ions, or 0 to 60 g/l of zinc ions in the case of zinc-rich surfaces before the wetting,
  - 0.5 to 40 g/l of manganese ions,
  - 20 - 50 to 300 g/l of phosphate ions, calculated as  $P_2O_5$ ,
  - 0.5 to 120 g/l of peroxide ions, calculated as  $H_2O_2$ , and/or
  - 0.5 to 50 g/l of polymers, copolymers and/or cross polymers.
- 25 3. Method according to one of the preceding claims, characterised in that the phosphating solution is free or substantially free of nickel or contains up to 20 g/l of nickel ions.
- 30 4. Method according to one of the preceding claims, characterised in that the phosphating solution contains polymers, copolymers and/or cross polymers, in particular of N-containing heterocyclic compounds, preferably of vinyl pyrrolidones.
- 35 5. Method according to one of the preceding claims, characterised in that a phosphating solution is used in

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which the ratio of the sum of cations to the phosphate ions, calculated as  $P_2O_5$ , lies in the range from 1:1 to 1:8.

- 5 6. Method according to one of the preceding claims, characterised in that an amount of phosphating solution in the range from 1 to 12 ml/m<sup>2</sup> is applied to the metal parts for drying.
- 10 7. Method according to one of the preceding claims, characterised in that a layer having a layer weight for the precipitated and dried phosphate layer in the range from 0.2 to 5 g/m<sup>2</sup> is formed with the phosphating solution.
- 15 8. Method according to one of the preceding claims, characterised in that the phosphating solution is applied to the metal part by spraying, by roller application, by flooding and subsequent squeezing off, by splashing and
- 20 20 subsequent squeezing off or by dipping and subsequent squeezing off.
- 25 9. Method according to one of the preceding claims, characterised in that the liquid film formed on the metal part with the phosphating solution is dried on the surface of the metal part at temperatures in the range from 20 to 120°C with respect to PMT temperatures.
- 30 10. Method according to one of the preceding claims, characterised in that a phosphate layer having the following composition is formed:
  - free or substantially free of nickel or up to a content of 10% by weight nickel
  - 5 to 40% by weight Zn,
  - 35 - 1.5 to 14% by weight Mn, and
  - 20 to 70% by weight phosphate, calculated as  $P_2O_5$
11. Method according to one of the preceding claims,

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characterised in that after drying a first phosphating solution corresponding to at least one of the preceding claims, the metal parts are wetted with a second aqueous, acidic phosphating solution, this second solution

5 - being free or substantially free of nickel, or containing up to 20 g/l of nickel ions in the phosphating solution and

- 0 to 20 g/l of zinc ions,

- 0 to 5 g/l of manganese ions, and

10 - 5 to 50 g/l of phosphate ions, calculated as  $P_2O_5$ .

12. Method according to one of the preceding claims, characterised in that before wetting with the first and/or second phosphating solution, the metal parts are

15 wetted with an activating solution or activating suspension.

13. Method according to one of the preceding claims, characterised in that the first phosphating solution

20 contains at least 0.3 mg/l of copper ions, and the second phosphating solution which is possibly used contains 0.1 to 50 mg/l of copper ions.

14. Method according to one of the preceding claims,

25 characterised in that a first and/or second phosphating solution is used in which the A-value, as ratio of the free acid to the total content of the phosphate ions, lies in the range from 0.03 to 0.6.

30 15. Method according to one of the preceding claims, characterised in that the first and/or second phosphating solution contains at least one catalyst such as, for example, a peroxide, a substance based on nitroguanidine, based on nitrobenzene sulphonic acid or based on

35 hydroxylamine, a chlorate, a nitrate, a perborate or an organic nitro compound, such as p-nitrotoluene sulphonic acid.

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16. Method according to one of the preceding claims, characterised in that the first and/or second phosphating solution contains a peroxide admixture, preferably  $H_2O_2$ , in a concentration in the range from 1 to 100 g/l, 5 calculated as  $H_2O_2$ .
17. Method according to one of the preceding claims, characterised in that the first and/or second phosphating solution has a content of at least one compound based on 10 perboric acid, lactic acid, tartaric acid, citric acid and/or a chemically related hydroxy carboxylic acid.
18. Method according to one of the preceding claims, characterised in that the first and/or second phosphating 15 solution has a content of ions of aluminium, boron, iron, hafnium, molybdenum, silicon, titanium, zirconium, fluoride and/or complex fluoride, in particular 0.01 to 5 g/l of fluoride in free and/or bound form.
- 20 19. Method according to one of the preceding claims, characterised in that the first and/or second phosphating solution is applied at a temperature in the range from 10 to 80°C.
- 25 20. Method according to one of the preceding claims, characterised in that a passivating solution is applied directly to a phosphate layer, in particular by spraying, dipping or rolling.
- 30 21. Method according to one of the preceding claims, characterised in that the first and/or second phosphate layer which has dried on to the metal part is wetted with an oil, a dispersion or a suspension, in particular a deforming oil or anticorrosive oil and/or a lubricant.
- 35 22. Method according to one or more of the preceding claims, characterised in that an oil coating or lubricant coating which is possibly present is removed from or out

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of the first or second phosphate layer respectively.

23. Method according to one of the preceding claims,  
characterised in that the metal parts which have been  
5 provided with a first and/or second phosphate layer are  
coated with a lacquer paint, with another type of organic  
coating and/or with a layer of adhesive, and possibly  
deformed, in which case the metal parts which have been  
coated in this way can additionally be glued, welded,  
10 and/or connected in another way to other metal parts.

24. Method according to one of the preceding claims,  
characterised in that the metal parts which have been  
provided with a first and/or second applied phosphate  
15 layer are coated with a coating corresponding to claim 23  
either before or not until after the deformation and/or  
assembly.

25. Use of the metal parts coated according to the  
method in accordance with at least one of claims 1 to 24  
as pre-phosphated metal parts for a renewed conversion  
treatment or for a renewed conversion pretreatment, in  
particular before lacquer painting, or as pretreated  
metal parts, in particular for the automobile industry,  
25 particularly before lacquer painting, or as finally  
phosphated metal parts, which are possibly also  
subsequently lacquer painted, coated in another organic  
way, coated with a layer of adhesive, deformed, assembled  
and/or welded together.

30  
26. Use of the metal parts coated according to the  
method in accordance with at least one of claims 1 to 24  
for the production of components or body portions or pre-  
assembled elements in the automobile industry or aircraft  
35 industry, in the construction industry, in the furniture  
industry, for the production of appliances and  
installations, in particular household appliances,  
measuring apparatus, control devices, testing devices,

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structural elements, casings, and also of small parts.

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